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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
HUGHES, SCOTT A	

ART UNIT	PAPER NUMBER
3663	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/530,443	MEUNIER ET AL.
	Examiner	Art Unit
	Scott A. Hughes	3663

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 July 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *11-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *11-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 April 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/12/2007 has been entered.

Response to Arguments

Applicant's arguments and amendments filed 6/14/2007 are sufficient to overcome the objections to the claims.

Applicant's arguments filed 6/14/2007 with respect to the rejections under 35 USC 103 have been fully considered but they are not persuasive.

Applicant argues that the Gendelman reference does not teach that the induced microseismic signals and the seismic signals are obtained during active seismic monitoring. This argument is not persuasive, as Gendelman discloses that the microseismic signals are recorded during the active survey as well as during the passive survey (Column 3, Lines 10-62).

Applicant argues that Gendelman does not teach separation of the induced microseismic signals from the seismic signals resulting from active monitoring by isolating a contribution thereof by comparison with a reference spectral model

accounting for spectral contributions of each seismic source at emitted fundamental frequencies and respective harmonics. Applicant further argues that Gendelman does not teach the reference spectral model. These arguments are not persuasive because the spectral model obtained from the passive monitoring is a reference spectral model to which the active monitoring signals are compared. The reference spectral model accounts for the spectral contribution of each seismic source because the spectral contributions of each source obtained in active monitoring are compared to the model. The limitation "accounting for" is a broad limitation, and since the reference model can be used to make a comparison to the records obtained from the contributions of each source, it accounts for each source.

Applicant argues that the Sallas reference does not teach orthogonal signals. This argument is not persuasive because Sallas teaches vibrators that generate signals that are phase shifted by 90 degrees in relation to each other. The 90-degree differences between the phases make them orthogonal.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gendelman (6442489) in view of Sallas (5721710).

With regard to claim 11, Gendelman discloses a method of active seismic monitoring of an underground formation providing separation of induced microseismicity signals from seismic signals emitted within a context of active seismic monitoring of an underground zone under development, the induced microseismicity signals and the seismic signals being obtained during the active seismic monitoring (abstract; Column 2, Lines 1-30; Column 3; Column 5, Line 37 to Column 6, Line 33). Gendelman discloses carrying out seismic recording cycles with emission of seismic waves in the formation by coupling therewith at least one seismic source, which emits signals so as to form a composite vibrational signal, receiving signals reflected by the formation in response to the emission of seismic waves, recording the signals received by at least one seismic pickup and processing the recorded signals (Column 2, Lines 1-20; Column 3, Lines 30-61; Column 4, Lines 14-55; Column 5, Line 37 to Column 6, Line 33). Gendelman discloses separating the induced microseismicity signals in the records from the seismic signals resulting from active monitoring operations, by isolating a contribution thereof by comparison with a reference spectral model, the reference spectral model accounting for the spectral contributions of each seismic source at the emitted fundamental frequencies emitted and at the respective harmonics thereof, and by reconstructing the microseismicity signals by inversion in the time domain (abstract; Column 2, Lines 1-30; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman shows the signals in the frequency domain, and it is known in the art that an inverse Fourier Transform returns the signals to the time domain. Gendelman does not disclose that the sources emit

simultaneously orthogonal signals so as to form a composite vibrational signal or processing of the received signals so as to separate contributions of each seismic source to the received signals and to reconstruct seismograms equivalent to those that would be obtained by actuating the each seismic source separately. Sallas teaches using multiple vibrators for hydrocarbon monitoring that emit orthogonal signals so as to form a composite vibrational signal (abstract; Column 4, Line 35 to Column 5, Line 15; Columns 11-12). Sallas teaches processing the data to reconstruct the seismograms equivalent to those that would be obtained by actuating the seismic sources separately (abstract; Column 4, Line 35 to Column 5, Line 15; Columns 11-12). It would have been obvious to modify Gendelman, who discloses the use of vibrators, to operate the separate vibrators to emit orthogonal signals and to process the obtained signals to separate the contribution of each source as taught by Sallas in order to obtain data for each vibrator-receiver path to image the formation.

With regard to claim 12, Gendelman discloses that a spectral contribution of the microseismicity signals to the spectrum of the signals received is obtained by subtracting amplitude and phase values associated with the reference spectral model from the amplitude and phase of the spectrum associated with the records (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 13, Gendelman discloses that the reference spectral model is a current spectral model formed by updating a previous model by taking account of

the spectral contribution of previous recording cycles (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 14, Gendelman discloses that a current spectral is formed by determining a mean value of the frequency spectra formed from earlier or later records obtained for a same source and frequencies which are the same (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 15, Gendelman discloses that a current spectral model is formed by determining a median value of the frequency spectra formed from earlier records obtained for the same source and frequencies which are the same (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 16, Gendelman discloses that a current spectral model is formed by extrapolation of interpolation from the frequency spectrum from spectral values (abstract; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8).

With regard to claim 17, Gendelman discloses a method of active seismic monitoring of an underground formation including discrimination of induced microseismicity signals from among signals emitted within the context of active seismic monitoring of an underground zone under development, the induced microseismicity signals and the seismic signals being obtained during the active seismic monitoring (abstract; Column 2, Lines 1-30; Column 3; Column 5, Line 37 to Column 6, Line 33).

Gendelman discloses carrying out seismic recording cycles with emission of seismic waves in a formation by coupling therewith seismic sources emitting so as to form a composite vibration signal. Gendelman discloses receiving signals reflected by the formation in response to emission of seismic waves, recording the signals received by a seismic receiver means, and processing of the recorded signals (Column 2, Lines 1-20; Column 3, Lines 30-61; Column 4, Lines 14-55; Column 5, Line 37 to Column 6, Line 33). Gendelman discloses separating the induced microseismicity signals in the records from the seismic signals resulting from active monitoring operations, by isolating a contribution thereof by comparison with a reference spectral model, the reference spectral model accounting for the spectral contributions of each seismic source at the emitted fundamental frequencies emitted and at the respective harmonics thereof, and by reconstructing the microseismicity signals by inversion in the time domain (abstract; Column 2, Lines 1-30; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman shows the signals in the frequency domain, and it is known in the art that an inverse Fourier Transform returns the signals to the time domain. Gendelman discloses calculating a ratio of a contribution to a current spectral model formed by updating a previous spectral model from frequencies emitted during the previous recording and from harmonics thereof (abstract; Column 2, Lines 1-30; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman discloses deducing a part of the recording n of cycle p that can be associated with active seismic monitoring operations. Gendelman discloses deducing a part of the recording n of cycle p related

to passive microseismic activity. Gendelman discloses forming by inversion the seismograms that can be associated with active seismic monitoring operations by inversion in a time domain of the respective spectral contributions of each seismic source at fundamental frequencies and at harmonics thereof, after completion of a measuring cycle. Gendelman discloses forming underlying microseismic signals contained in the records by inversion in a time domain from a part related to passive microseismic activity (abstract; Column 2, Lines 1-30; Column 3; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman shows the signals in the frequency domain, and it is known in the art that an inverse Fourier Transform returns the signals to the time domain. Gendelman does not disclose that the sources emit simultaneously and are controlled by orthogonal signals. Gendelman does not disclose processing the received data so as to separate the respective contributions of the seismic sources to the signals received and to reconstruct seismograms equivalent to seismograms that would be obtained by separately actuating the each seismic source. Gendelman does not disclose that for each recording n of recording cycle p, the respective contributions of various sources at the fundamental frequencies are calculated. Sallas teaches using multiple vibrators for hydrocarbon monitoring that emit orthogonal signals so as to form a composite vibrational signal (abstract; Column 4, Line 35 to Column 5, Line 15; Columns 11-12). Sallas teaches processing the data to reconstruct the seismograms equivalent to those that would be obtained by actuating the seismic sources separately (abstract; Column 4, Line 35 to Column 5, Line 15; Columns 11-12). It would have been obvious to modify

Gendelman, who discloses the use of vibrators, to operate the separate vibrators to emit orthogonal signals and to process the obtained signals to separate the contribution of each source at the fundamental frequencies as taught by Sallas in order to obtain data for each vibrator-receiver path to image the formation.

With regard to claim 18, Gendelman discloses that the respective contributions are obtained by multiplying a transfer function between a wavelet characteristic of the source and a seismogram associated with a receiver r, by a wavelet characteristic of a source (abstract; Column 2, Lines 1-30; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman discloses that the spectral contribution is obtained by a multiplication of the active and passive signals, which includes a multiplication of the wavelet characteristic of the source (source signals) and the seismograms associated with the receiver that records active and passive signals. It would have been obvious to obtain the spectral contributions for each source when multiples sources are used in the survey as taught by Sallas.

With regard to claim 19, Gendelman discloses that the transfer function is continuously updated (abstract; Column 2, Lines 1-30; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman discloses that the passive signals are recorded before and after the active signaling, and therefore the transfer function which involves these passive signals is updated with each new acquisition of passive data.

With regard to claim 20, Gendelman discloses that updating of the transfer function is obtained during a current cycle from an estimation made during a previous

cycle and from an initial estimation made during a current cycle by the relation given in the claim (abstract; Column 2, Lines 1-30; Column 4, Line 14 to Column 5, Line 5; Column 5, Line 37 to Column 6, Line 33) (Figs. 3-8). Gendelman discloses that the passive signals are recorded before and after the active signaling, and therefore the transfer function which involves these passive signals is updated with each new acquisition of passive data. The updated would include an updating coefficient h relating to the change in the model between receptions of the passive signals.

Conclusion

The cited prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A. Hughes whose telephone number is 571-272-6983. The examiner can normally be reached on M-F 9:00am to 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jack Keith can be reached on (571) 272-6878. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SaH

SAH

JACK KEITH
SUPERVISORY PATENT EXAMINER